



Space Day: Prospecting for Knowledge

10-Reaping Rocks – Teacher Page

Purpose: To make predictions about the origin of lunar rocks by first collecting, describing, and classifying neighborhood rocks.

Background: Geologists are scientists who study the formation, structure, history, and processes (internal and on the surface) that change Earth and other planetary bodies.

Rocks and the minerals in them give geologists key information about the events in a planet's history. By collecting, describing and classifying rocks, we can learn how the rocks were formed and what processes have changed them. Geologists classify rocks into three types:

Igneous - rock formed when magma cools and hardens either below the surface (for example, granite) or on the surface during volcanic events (for example, basalt).

Sedimentary - rock formed by the collection, compaction, and cementation of mineral grains, rock fragments, and sand that are moved by wind, water, or ice to the site of deposition.

Metamorphic - rock formed when heat and/or pressure deep within the planet changes the mineral composition and grain size of existing rocks. For example, metamorphism changes limestone into marble.

We find all three rock types on Earth's surface and the rocks are constantly changing (recycling), very slowly because of heat, pressure, and exposure to weather and erosion.

The Moon's surface is dominated by igneous rocks. The lunar highlands are formed of anorthosite, an igneous rock predominantly of calcium-rich plagioclase feldspar. The lunar maria are made of layers of basaltic lava, not unlike the basaltic flows of the Columbia River Plateau or of Iceland. The orange glass found on the Moon's surface is another product of volcanic activity. Moon rocks are not exposed to weather nor are they eroded by wind, water, or ice. The Apollo astronaut's footprints are as fresh as the day they were made.

Materials: Rocks; Empty egg carton, box, or other collection tray; Labels; Magnifying lens or stereo microscope; "My Own Rock Chart"; "Moon ABCs Fact Sheet"

Preparation: Review and prepare materials listed on the student sheet. Spend time familiarizing the students with rock and mineral identification.

Students may need more than one copy of "My Own Rock Chart" because it has spaces for only three samples. You may want to collect empty egg cartons, small boxes, or trays that the students could decorate themselves to display their rocks. Use of magnifying lenses or a stereo microscope would greatly enhance observations.



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"Moon ABCs Fact Sheet" may come in handy during the wrap-up when students try to make predictions about the Moon rocks.



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10-Reaping Rocks – Student Page

Purpose: To make predictions about the origin of lunar rocks by first collecting, describing, and classifying neighborhood rocks.

Procedure:

1. Display your rocks on a tray or egg carton, and label each one with the location of where you found it.
2. Look carefully at each rock with and without a magnifying lens or stereo microscope. What details can you see under magnification?
3. Describe what you see by filling out "My Own Rock Chart." Use as many adjectives or descriptive phrases as you can.
4. Classify your rocks as igneous, sedimentary or metamorphic. Try to interpret how your rocks were formed; that is, try to determine the origins. Add this information to your chart.
5. Now, based on your chart and the "Moon ABCs Fact Sheet," predict what the Moon rocks will look like.
6. How do you think the different Moon rocks might have formed?

My Own Rock Chart

Observations	Sample _____	Sample _____	Sample _____
Sketch of Sample			
Shape			
Size			
Color			
Texture			
Apollo Mission/Collection Site			
Interpretations	Sample _____	Sample _____	Sample _____



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Classification			
Origin			



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Moon ABCs Fact Sheet

Property	Earth	Moon	Brain Busters
Equatorial diameter	12,756 km	3,476 km	How long would it take to drive around the Moon's equator at 80 km per hour?
Surface area	510 million square km	37.8 million square km	The Moon's surface area is similar to that of one of Earth's continents. Which one?
Mass	5.98×10^{24} kg	7.35×10^{22} kg	What percentage of Earth's mass is the Moon's mass?
Volume	??	??	Can you calculate the volumes of Earth and the Moon?
Density	5.52 grams per cubic cm	3.34 grams per cubic cm	Check this by calculating the density from the mass and volume.
Surface gravity	9.8 m/sec/sec	1.63 m/sec/sec	What fraction of Earth's gravity is the Moon's gravity?
Crust	Silicate rocks. Continents dominated by granites. Ocean crust dominated by basalt.	Silicate rocks. Highlands dominated by feldspar-rich rocks and maria by basalt.	What portion of each body is crust?
Mantle	Silicate rocks dominated by minerals containing iron and magnesium.	Similar to Earth.	Collect some silicate rocks and determine the density. Is the density greater or lesser than the Earth/Moon's density? Why?
Core	Iron, nickel metal	Same, but core is much	What portion of each



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Moon ABCs Fact Sheet (Contd)

Property	Earth	Moon	Brain Busters
Sediment or Regolith	Silicon and oxygen bound in minerals that contain water, plus organic materials.	Silicon and oxygen bound in minerals, glass produced by meteorite impacts, small amounts of gases (e.g., hydrogen) implanted by the solar wind. No water or organic materials.	Do you think life ever existed on the Moon? Why or why not?
Atmospheric (main constituents)	78% nitrogen, 21% oxygen	Basically none. Some carbon gases, but very little of them. Pressure is about one-trillionth of Earth's atmospheric pressure.	Could you breathe the lunar atmosphere?
Length of day (sidereal rotation period)	23.93 hours	27.3 Earth days	How long does daylight last on the Moon?
Temperature	Air temperature ranges from -88C (winter in polar regions) to 58C (summer in tropical regions).	Surface temperature ranges from -193C (night in polar regions) to 111C (day in equatorial regions).	Why are the temperatures of Earth and the Moon so different?
Surface features	25 percent land (seven continents) with varied terrain of mountains, plains, river valleys. Ocean floor characterized by mountains, plains, and trenches.	84 percent heavily-cratered highlands. 16 percent basalt-covered maria. Numerous impact craters - some with bright rays, crater chains, and rilles.	Compare maps of Earth and the Moon. Is there any evidence that plate tectonics operated on the Moon?